Spectrum Situational Awareness System (S2AS) Brief

SIGCoE/CDID/TCM GNE

Frequency Spectrum Proponency Office (FSPO)

15 Dec 2011

Purpose

**provide a description of the Spectrum Situational
wareness System (S2AS) and the status of the initiati**

Problem

Spectrum operations today are conducted using databases which do not accurately depict actual spectrum use because:

- **Inaccurate database: missing info; erroneous info.**
- **Many radio systems deployed are operating without G/S 6 knowledge, planning or forethought on impact to operations.**
- **Limited knowledge of frequency assignments of adjacent units, coalition partners, civil, NGO, etc.**

There is no tool to sense, analyze, and share the actual spectrum being used.

Background

- **In February of 2007, this capability gap was identified and expanded on by the improvised explosive device-defeat (IED-D) Integrated Capabilities Development Team (ICDT).**
- **As a member of this ICDT the Frequency Spectrum Proponency Office (FSPO) investigated potential solutions to mitigate the gap and in late 2008 developed the S2AS initiative.**
- **Procured initial systems with EOY $$ from Army IED-D ICDT.**
- **FY 2009 deployed and/or trained systems to 1 CAV, 1 AD, 82d ABN, 1 Corps, Joint Spectrum Center, Crane Naval Station, and 1MEF.**
- **Feb/Mar 10 FSPO team deployed to theater (OEF/OIF) to satisfy CENTCOM J6 request for S2AS MTT.**
- **Mar 11 USD-C ONS for S2AS**
- **Unsuccessfully solicited support from both PD COMSEC and PM GEMSIS. There is *NO* PM for Spectrum.**

Purpose of Initiative

To train and equip spectrum operators with a capability to:

- **Sense actual spectrum use in an operational environment**
- **Analyze the collected data**
- **Share this data with other spectrum management systems and appropriate units and agencies to aid in the deconfliction of the spectrum.**

Provide real time spectrum situational awareness on CREW, EW, friendly and civil spectrum use.

S2AS Description

- S2AS provides the spectrum operator with a capability to sense actual spectrum use in an operational environment, analyze the data, and share the data with other systems and users.
- S2AS is comprised of both a software component (Multi Spectral Ambient Noise Collection and Analysis Tool-MANCAT) and hardware (Rohde & Schwarz PR100 monitoring receiver and antenna kits)

S2AS Overview

The monitoring receiver used is the Rohde & Schwarz PR100 which provides the ability to monitor the spectrum and provide this as an output to the MANCAT software for analysis and sharing.

Monitoring Receiver
(Spectrum Analyzer)

Direction Finding
Antenna Kit HE-300

20Khz -6.5GHz
Antenna

20-1800MHz
Antenna

3-8GHz
Antenna

Antenna Kit

MANCAT
Software

DAGR/PLGR
GPS

The software used is the multi spectral ambient collection and analysis tool (MANCAT) which provides the ability to take the feed from the PR100 and allow comparison, analysis, and sharing of this information among spectrum managers. The information can be displaye in a variety of formats to include HTML, JPEG, CSV, and text. MANCAT is a GOTS software developed by the Electronic Proving Ground.

- Unit provides laptop and DAGR/PLGR.
- Hardware cost per system approx $38k
- Software is GOTS (no cost)

R & S PR100 Monitoring Receiver

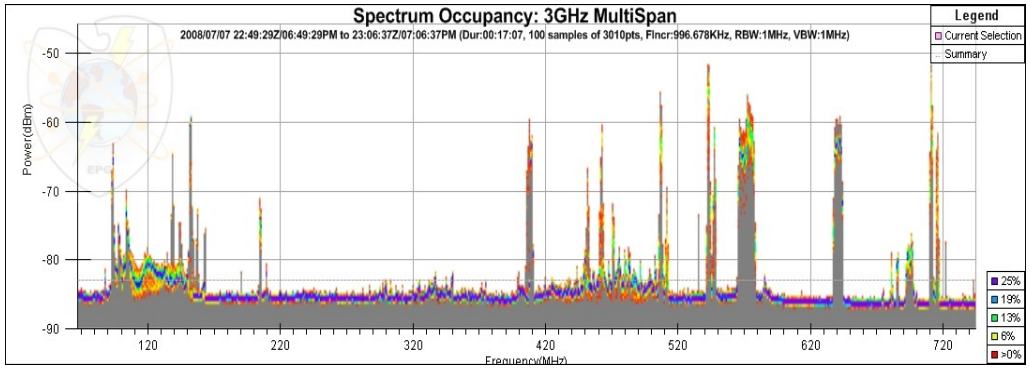
- Fast panorama scan across the entire frequency range from 9 kHz to 7.5 GHz
- 10 MHz IF spectrum and demodulation with bandwidths from 150 Hz to 500 kHz
- Spectrum and spectrogram (waterfall) display on 6.5“ color screen
- Storage of measurement data to SD card in receiver
- LAN interface for remote control and data output
- Ergonomic and rugged design for portable use
- Low weight of 3.5 kg (including battery)
- Location of emissions by means of R&S®HE300 active directional antenna

MANCAT Overview

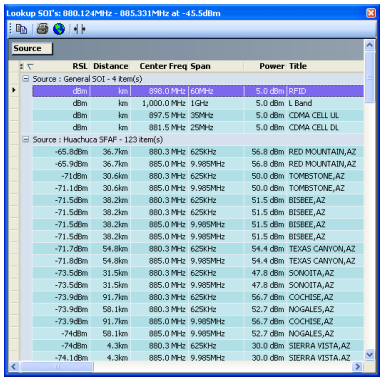
- **MANCAT: Multi-spectral Ambient Noise Collection & Analysis Tool**
- **Controls and collects data from collection device (spectrum analyzer/monitoring receiver/other) based on operator selected parameters.**
- **Analysis of both fixed and mobile scans (with GPS attached).**
- **Provides a means to analyze the collection data not only by frequency/power but also in time as well as duty cycle of frequencies.**
- **Summarizes the measurements into detailed, interactive charts allowing the user to drill down into the data.**
- **Allows import of SFAF or other spectrum data such as ARAT-PO to overlay onto collected data.**

Capability Overview

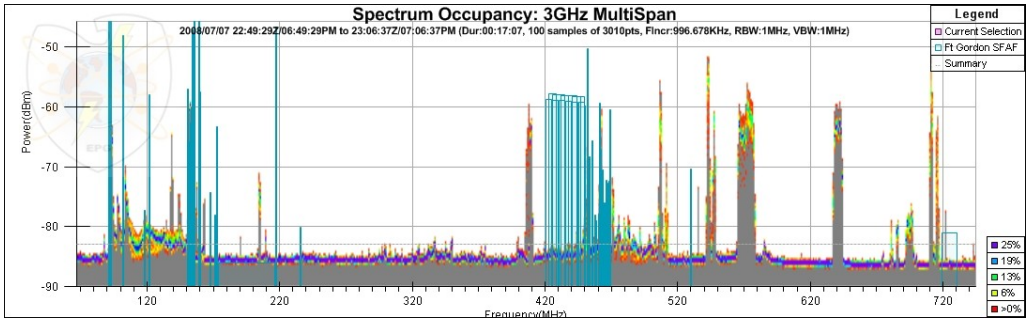
SENSE



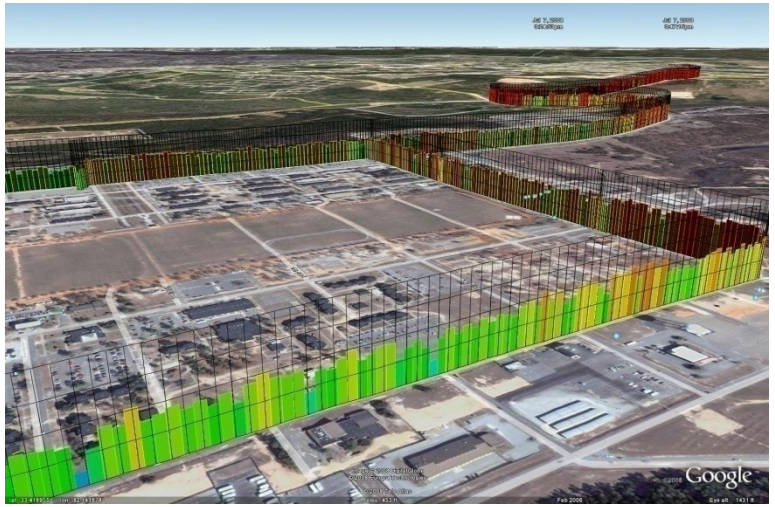
SHARE/REPORT


Lookup SOI's: 880.124MHz - 885.331MHz at -45.5dBm
Source
RSL Distance Center Freq Span Power Title
Source : General SOI - 4 item(s)
dBm km 898.0 MHz 60MHz 5.0 dBm RFID
dBm km 1,000.0 MHz 1GHz 5.0 dBm L Band
dBm km 897.5 MHz 35MHz 5.0 dBm CDMA CELL UL
dBm km 881.5 MHz 25MHz 5.0 dBm CDMA CELL DL
Source : Huachuca SFAF - 123 item(s)
-65.8dBm 36.7km 880.3 MHz 625KHz 56.8 dBm RED MOUNTAIN,AZ
-65.9dBm 36.7km 885.0 MHz 9.985MHz 56.8 dBm RED MOUNTAIN,AZ
-71dBm 30.6km 880.3 MHz 625KHz 50.0 dBm TOMBSTONE,AZ
-71.1dBm 30.6km 885.0 MHz 9.985MHz 50.0 dBm TOMBSTONE,AZ
-71.5dBm 38.2km 880.3 MHz 625KHz 51.5 dBm BISBEE,AZ
-71.5dBm 38.2km 880.3 MHz 625KHz 51.5 dBm BISBEE,AZ
-71.5dBm 38.2km 885.0 MHz 9.985MHz 51.5 dBm BISBEE,AZ
-71.5dBm 38.2km 885.0 MHz 9.985MHz 51.5 dBm BISBEE,AZ
-71.7dBm 54.8km 880.3 MHz 625KHz 54.4 dBm TEXAS CANYON,AZ
-71.8dBm 54.8km 885.0 MHz 9.985MHz 54.4 dBm TEXAS CANYON,AZ
-73.5dBm 31.5km 880.3 MHz 625KHz 47.8 dBm SONOITA,AZ
-73.5dBm 31.5km 885.0 MHz 9.985MHz 47.8 dBm SONOITA,AZ
-73.9dBm 91.7km 880.3 MHz 625KHz 56.7 dBm COCHISE,AZ
-73.9dBm 58.1km 880.3 MHz 625KHz 52.7 dBm NOGALES,AZ
-73.9dBm 91.7km 885.0 MHz 9.985MHz 56.7 dBm COCHISE,AZ
-74dBm 58.1km 885.0 MHz 9.985MHz 52.7 dBm NOGALES,AZ
-74dBm 4.3km 880.3 MHz 625KHz 30.0 dBm SIERRA VISTA,AZ
-74.1dBm 4.3km 885.0 MHz 9.985MHz 30.0 dBm SIERRA VISTA,AZ

ANALYZE



VISUALIZE



Vignettes

- **Interference of air/ground communications is being experienced at an airfield. The SM conducts a spectrum scan of the affected bands and finds that frequencies are being used that aren't in the database. The SM queries units and also uses the DF antenna to locate the source of the interference which turns out to be a radio system that has been modified and is operating outside of its authorized range. The G6 is notified for action.**
- **A new CREW system is installed at entry control points and communications inside the FOB experiences interference. The vendor insists that the cause is from another source. Using S2AS the SM is able to show exactly what systems and frequencies are being affected. The vendor replaces the omni directional antennas with directional antennas and the interference is eliminated.**

Current S2AS Status

- 35+ S2AS systems deployed in both Army and USMC units.
- System is being used in theater and CONUS locations to mitigate and resolve spectrum issues.
- Training Support Package has been developed and ESM Course has two systems and two more are being procured.
- ARCIC and SIGCoE conducted a doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF) assessment in theater Nov 11.
- ARCIC and SIGCoE teamed to take S2AS through Capabilities Development for Rapid Transition (CDRT)-path to program of record (POR).

Conclusion

QUESTIONS???